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CAPITAL - LABOR SUBSTITUTION

A Recent Look at Relationships In Swine Production

by

Allan E. Lines
Agricultural Economist
Department of Agricultural Economics and Rural Sociology
The Ohio State University
and
USDA/ERS/NED/EI

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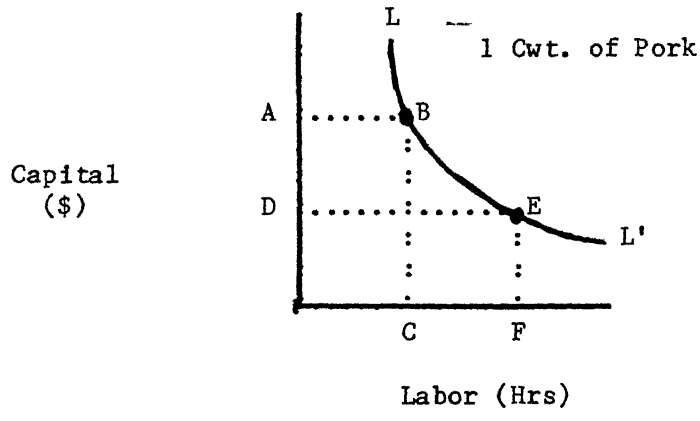
INTRODUCTION

The notion of capital and labor as substitutes in production is as old as man himself. Early man, by investing today's labor in the creation of crude tools, made tomorrow's labor easier and/or more productive. Even in today's most primitive societies a good herdsman knows that investing in a good dog is better than hiring his brother-in-law. Swine confinement, the process of substituting capital for labor, began when pastures were first fenced to reduce the labor needed to harvest the pork. The process continued with the adoption of portable pasture buildings, to the use of permanent structures in conjunction with open feedlots, to today's high-tech pork factories.

Recent changes in product prices and production costs (i.e. feed, fuel, captial, labor, etc.) have prompted reconsidering the adviseability of constructing high investment swine production facilites. Have cost relationships changed enough to warrant reversing the adoption of capital-based technology and turn toward systems that use less capital and more labor? Understanding the substitutability of capital and labor can help answer this question and help explain the seemingly inconsistent profitable co-existence of so many different production systems.

In an abstract sense we can see from Figure 1 that it is possible to produce pork with many different combinations of labor and capital. Notice that the same amount of pork (i.e. 100 pounds) can be produced using quantity A of capital with amount C of labor or by using quantity D of capital with amount F of labor. Each point on the curved line LL' represents 100 pounds

Figure 1



of pork produced with a different combination of capital and labor. We must ask, however, ..." Does the theory reflect the real world?" The following information and discussion addresses this question.

CURRENT CAPTIAL - LABOR RELATIONSHIPS

The production sytems used in these analyses can be broadly described as follows:

(1) High Capital/Low Labor (A) - high investment confinement

(2) Medium Capital/Medium Labor (B) - pasture systems

(3) Low Capital/High Labor (C) - low investment confinement

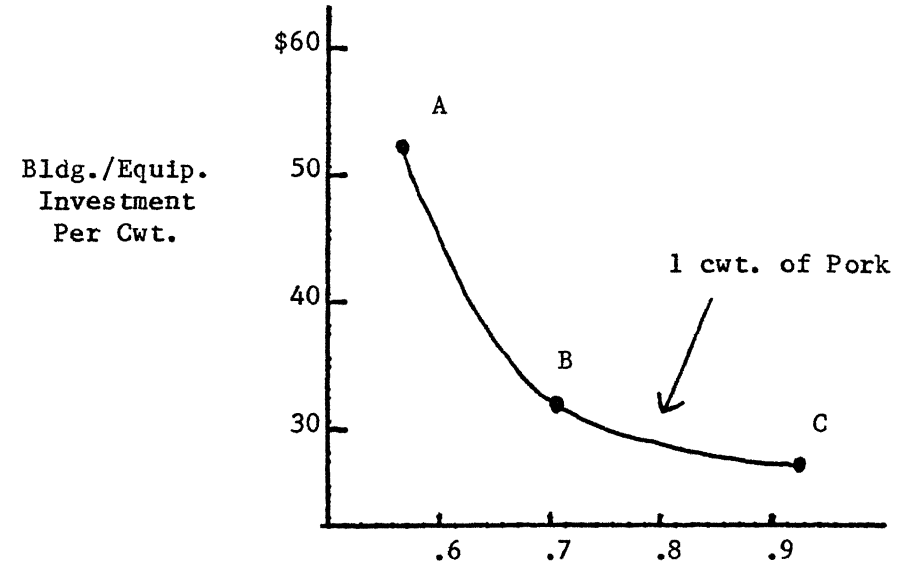
It is interesting to note that pasture systems, traditionally thought of as low investment systems require more capital per unit of output than low investment confinement systems. This is largely the result of fencing costs.

Table 1. FARROW-TO-FINISH SWINE PRODUCTION
Capital - Labor Requirements
1986

Item	Alternative Production Systems		
	High Capital Low Labor (A)	Medium Capital Medium Labor (B)	Low Capital High Labor (C)
Labor Hours Per Cwt.	.58	.71	.93
Bldg./Equip Investment			
Per Cwt.	$53	$35	$31
Per Hour	$92	$49	$34
Per Man	$276,000	$147,000	$102,000

Source: D. Bache - Purdue University

Figure 2



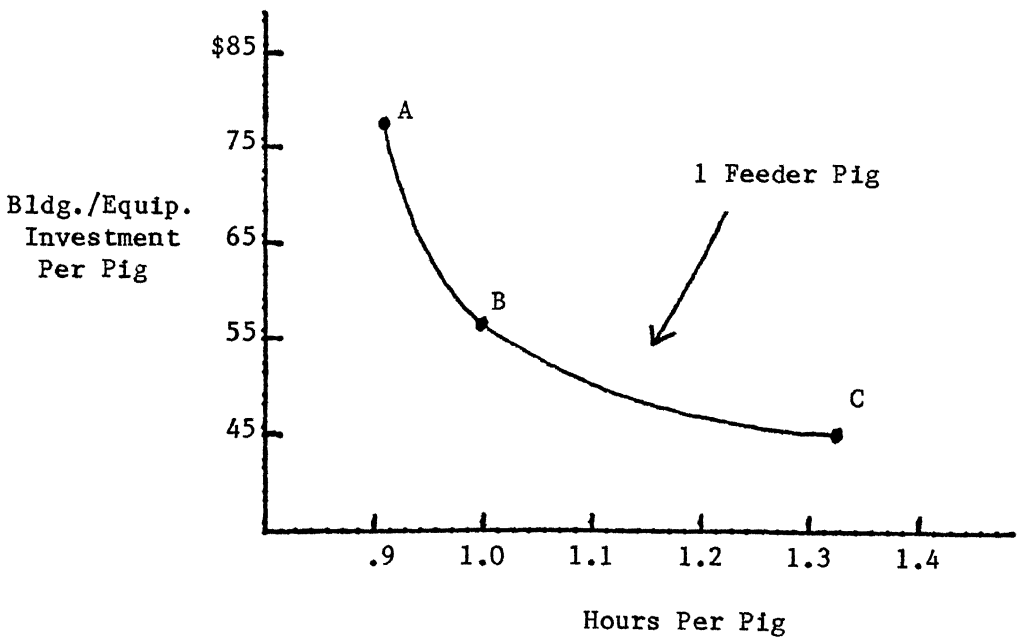
FARROW TO FINISH SWINE PRODUCTION
CAPITAL/LABOR COMBINATIONS

Table 2. FEEDER PIG PRODUCTION
Capital - Labor Requirements
1986

Item	Alternative Production Systems		
	High Capital Low Labor (A)	Medium Capital Medium Labor (B)	Low Capital High Labor (C)
Labor Hours Per Pig	.92	1.0 1/	1.33
Bldg./Equip Investment			
Per Pig	$77	$56	$46
Per Hour	$83	$56	$34
Per Man	$250,000	$168,000	$102,000

Source: D. Bache - Purdue University
1/ Estimated.

Figure 3.



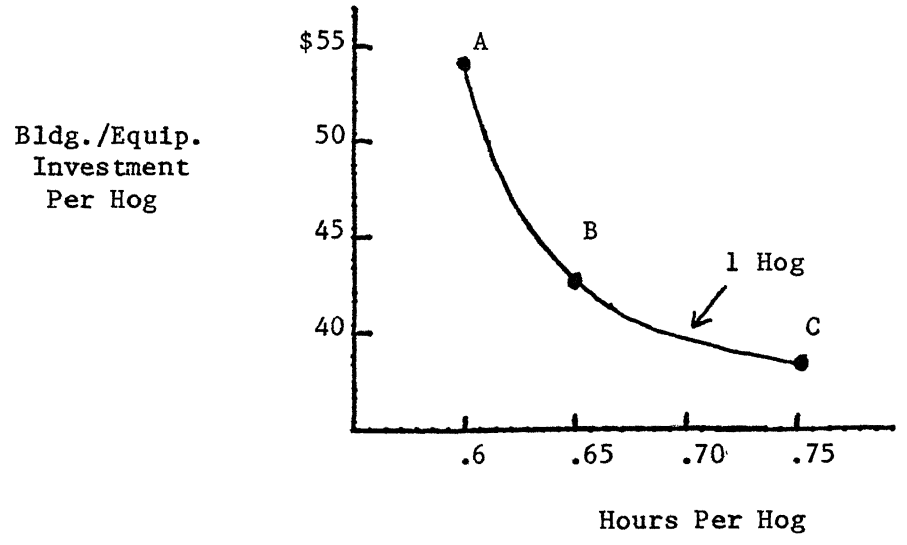
FEEDER PIG PRODUCTION
Capital - Labor Combinations

Table 3. FINISHING PURCHASED PIGS
Capital - Labor Requirements
1986

Item	Alternative Production Systems		
	High Capital Low Labor (A)	Medium Capital Medium Labor (B)	Low Capital High Labor (C)
Labor Per Hog	.60	.65 1/	.75
Bldg./Equip. Investment Per Hog	$54	$43	$39
Per Hour	$90	$66	$53
Per Man	$270,000	$198,000	$159,000

Source: D. Bache - Purdue University
1/ Estimated.

Figure 4.



FINISHING PURCHASED PIGS
Capital - Labor Combinations

WHICH COMBINATION?

There are many factors to consider when searching for the answer to this question and the answer is not the same for each producer. Items that must be taken into consideration would include: (1) quantity and type (equity or debt) of capital available, (2) the cost of capital (interest rate and/or opportunity cost), (3) the quantity, quality, timing, and cost of available labor, (4) animal performance (feed and breeding efficiency, litter sizes, and survival rates), (5) other enterprises on the farm, (6) prices of feed and costs of other inputs, (7) product prices, and (8) risk aversion and risk-bearing ability of the operator. Fortunately the total cost per unit of production does not vary greatly from system to system. This then permits operators, each with a different set of capital, labor, and management resources, to construct a multitude of systems and yet compete effectively in swine production. The young entrepreneur, generally long on labor and short on captial, can profitably build a small unit that complements other enterpises, diversifies the business, and reduces risk. At the same time a highly-skilled well-financed operator can profitably construct large specialized risky enterprises. It is the substitutability of capital and labor in the swine enterprise that has and will continue to permit the profitable co-existence of diverse production systems. Table 4 illustrates relative returns to capital and labor for the common systems used used in this analysis.

Table 4. CAPITAL AND LABOR RETURNS
Swine Production Systems
1986

Swine Production System	Rate Earned on Investment (%)	Return to Labor ($/Hr)
Farrow-to-finish		
High Cap.-Low Labor	10.4	8.82
Medium Cap.-Medium Labor	8.0	6.76
Low Cap.-High Labor	8.9	6.67
Feeder Pig Production		
High Cap.-Low Labor	5.5	5.04
Medium Cap.-Medium Labor	--	--
Low Cap.-High Labor	-.5	3.28
Finishing		
High Cap.-Low Labor	7.4	6.54
Medium Cap.-Medium Labor	--	--
Low Cap.-High Labor	6.1	5.62

Source: D. Bache - Purdue University
1/ Corn @ $2.50/bu.; Soybean meal @ $155/ton
Hogs @ $45/cwt.; Pigs sold @ $41/hd.
Labor @ $5.00/hr.